25.0 CALIFORNIA COASTAL CHINOOK ESU

25.1 BACKGROUND

25.1.1 Description of the ESU

The California Coastal Chinook Salmon (CCC) ESU currently consists of all natural populations of Chinook salmon from Redwood Creek to the Russian River, inclusive (BRT 2003). Also included in the ESU are Chinook salmon stocks artificially propagated at the Freshwater Creek, Yager Creek, Redwood Creek, Hollow Tree Creek, Mattole River, and Mad River Hatcheries and the Van Arsdale Fish Station.

25.1.2 Current Status of the ESU

The CCC ESU was listed as threatened in September 16, 1999 (64 FR 50394), due to the low abundance and continuing trend of decline; reduced distribution, particularly in the southern portion of the ESU; expected weak returns as a result of two small year classes in 1991 and 1993; and strong concerns for the spring-run Chinook salmon in the ESU (Myers *et al.* 1998). Previous status reviews also expressed concerned with impacts from direct and indirect human activity, including poor agricultural and forestry practices, water diversions, urbanization, mining, and severe flood events. Assessments by the BRT of the risks faced by the ESU were divided, with 67 percent of the votes being cast for "likely to be endangered", 24 percent for "in danger of extinction", and the remaining 9 percent for "neither" (BRT, 2003). The BRT believed that artificial propagation likely contributed to population abundance, but they were unsure of hatchery effects on the unknown productivity, spatial structure, and diversity of the ESU.

25.2 ASSESSMENT OF THE HATCHERY PROGRAMS

There are seven artificial propagation programs included in the ESU. Five small-scale supplementation facilities participate in the California Department of Fish and Game (CDFG) Cooperative Fish Rearing Program for purposes of fisheries restoration. Two augmentation programs are operated by CDFG, including an emergency stock rescue program in the upper Eel River at the Van Arsdale Fish Station and a second program in the Mad River. All hatchery programs included in the ESU have been scheduled for termination and will be phased out by 2005 (J. Ayers, CDFG, *pers. comm.*). The following section presents a summary of the broodstock history, similarity between hatchery origin and natural origin fish, program design, and program performance of these artificial propagation programs (Table 1).

Table 25.1. Artificial Propagation Programs that release Chinook salmon within the geographical area of the California Coastal Chinook ESU.

Program	Type	Included in ESU	Description	Production Level	Year Initiated
Freshwater Hatchery	integrated	yes	smolt	58,000	1969
Yager Creek Hatchery	integrated	yes	smolt	65,000	1976
Redwood Creek Hatchery	integrated	yes	smolt	80,000	1983
Hollow Tree Creek Hatchery	integrated	yes	smolt	185,000	1979
Mattole River Hatchery	integrated	yes	smolt	6,000	1980
Van Arsdale Fish Station	integrated	yes	pre-smolt yearling	25,000 25,000	1970
Mad River Hatchery	integrated	yes	smolt/yearling	5,000,000	1970

25.2.1 Natural Populations

It was previously proposed that the CCC ESU was a part of the larger Southern Oregon and California Coastal ESU, but genetic analysis (Myers *et al.* 1998) has distinguished the California coastal populations from the northern grouping. Likewise, the North Central California Coast Technical Recovery Team has hypothesized one to five independent populations within the Eel River basin (BRT 2003). Population structure within the CCC ESU may be further refined at a later time. There are no abundance estimates for any of the basins; monitoring efforts include enumerated adult returns at the Van Arsdale Fish Station and the Freshwater Creek weir; spawning surveys on Canon, Sprowl, and Tomki creeks and the Mad and Mattole rivers; and video monitoring on the Russian River (BRT 2003). There are limitations to analyzing the available data; however, a positive abundance trend has been inferred for Freshwater Creek and, to a lessor degree, the Mad River. Annual adult returns (>1,300-5,465) and juvenile outmigration abundance (>200,000) documented over the 2000-2002 monitoring seasons for the Russian River represent a significant presence of chinook salmon, currently of unknown genetic relationship to the ESU.

25.2.1.1 CCC ESU Hatchery Programs

25.2.1.1.1 Broodstock History. The CDFG cooperative rearing program was initiated to assist in the restoration of California salmonid populations. Programs are permitted by CDFG but are operated and supported by private parties, often on a volunteer basis. Program funding is provided by the Salmon Stamp Program, which is maintained by commercial fishing license sales. The five cooperative programs in the CCC ESU have been in existence for 21 to 35 years, but there has been little data collected to provide a basis for program evaluations.

25.2.1.1.2 Broodstock History. Broodstock is collected from adult returns to the hatcheries. The cooperative rearing hatcheries adipose fin-clip 100-percent of their production. As of 1998, VAFS marks its fish with a coded-wire tag. Only non-marked fish are collected for broodstock in the cooperative rearing programs; Mad River and VAFS collect both marked and unmarked fish for spawning purposes (SSHAG 2003). Previous out-of-basin transfers to the Mad River Hatchery include stocks from Minter Creek (650,000 juveniles), Freshwater Creek (45 female adults), and the Klamath-Trinity (6.4 million). Iron Gate Hatchery egg stock (625,000) had been imported to VAFS and released into the Eel River (1972-77) and 584,000 fish of unknown origin were planted in Freshwater Creek in 1970-72.

4.2.2.1.3 Similarity between Hatchery-origin and Natural-origin Fish. Allozyme data group the entire California Coastal ESU together, including a Mad River Hatchery sample (BRT 2003). The Van Duzen allozyme sample clusters in the center of the Coastal California samples (Myers *et al.* 1998). Hollow Tree Creek groups with the Redwood Creek (tributary to the Eel River) sample and then with the Eel River as part of the CCC ESU (Myers *et al*. 1998). The Mattole River allozyme datum groups within the CCC ESU but as an outer member in the cluster (Myers *et al.* 1998). There is not much genetic structure in the ESU (BRT 2003); however, genetic analysis does distinguish CCC populations from larger Southern Oregon and California Coastal ESU (Myers *et al.* 1998). The cooperative fish programs adipose fin-clip 100-percent of their production before juveniles are released and only spawn unclipped fish for their programs. Cooperative hatchery production is one generation removed from the wild, and hatchery fish exhibit the same run- and spawn-timing as the natural population. The VAFS also externally marks program fish 100 percent, but the Mad River marked only a portion of its production. Both facilities have incorporated natural and hatchery fish as broodstock for 30 years, and management effects on population run-timing and productivity are largely unknown.

24.2.1.1.4 Program Design. The cooperative hatcheries were designed to supplement natural production and increase the number of adults in the spawning population, assisting with chinook salmon recovery. The Mad River Hatchery program was designed to enhance chinook salmon populations, while the VAFS was originally established to collect fish eggs for transfer to other waters in California. In the later years of the VAFS program, eggs were collected and reared elsewhere, but production was released back into the Eel River (CDFG and NOAA Fisheries 2001).

24.2.1.1.5 Program Performance. The natural populations have not responded to the many years of significant effort by the cooperative rearing. Adaptive management of the programs was not established without a corresponding monitoring effort to allow for the evaluation of the effects of the programs on the natural populations. The Mad River Hatchery and VAFS chinook salmon programs have been discontinued, because they were no longer self-sustaining; chinook salmon returns to the facilities were inadequate to continue the hatchery programs. As these programs have only recently ended, the effects of hatchery supplementation in the basin may not be known for several seasons.

24.2.1.1.6 Effect on VSP

Abundance – Approximately 70 percent of the Freshwater Creek adult returns are hatchery-produced fish (1997-2000), while hatchery-origin fish make up 30 percent of chinook salmon returning to VAFS.

Productivity –There may have been some variance in population increases for some populations over the years, but there has been little response in productivity overall.

Spatial structure - There has been no evidence of an expansion of ESU spatial structure with the contribution of artificial propagation efforts.

Diversity – Broodstock has been collected from the native populations or from adult returns to the hatchery and is not thought to have impacted diversity. Previous out-of-basin transfers may have introgressed with the local stocks, and small spawning populations may have undergone genetic bottlenecks.

25.3 CONCLUSION

25.4 LITERATURE CITED

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